CHAPTER 3: RESEARCH METHODOLOGY

3.1 Research Design

This study is conducted using secondary data. Drawing on the companies listed on the Main Board and Second Board of the KLSE as its population, samples are collected by applying stratified sampling method.

There were 843 companies listed on the KLSE as of July 2002 summarised below. The Main Board are companies which are capitalized at more than RM20.0 million (subsequently increased to a minimum of RM60.0 million as of January 2001), while the Second Board's companies are generally capitalized at below RM20.0 million (subsequently increased to a minimum of RM40.0 million as of January 2001).

Table 3.1.1: Companies Listed on the KLSE as of July 2002

Segment	Main Board	Second Board	Total
PN 4	52	48	100
Viable	505	238	743
Total	557	286	843

Source: KLSE Website

Each segment are stratified by size and sectorial with equal samples selected from both groups outlined in the matrix table below:

Table 3.1.2: Samples of Research

Segment	Main Board (Numbers / % of population)	Second Board (Numbers / % of population)	Total (Numbers / % of population)
PN 4	20 / (38%)	20 / (42%)	40 / (40%)
Viable	20 / (4%)	20 / (8%)	40 / (5%)
Total	40 / (7%)	40 / (14%)	80 / (9%)

For the Ratio Model analysis, the company's Z-Score is the synthesis of a single measure comprising key financial ratios derived from its published accounts, weighted to provide an accurate index of corporate financial health or bankruptcy risk. The key financial ratios of the Z-Score comprise the following:

i) X_1 = working capital / total assets
ii) X_2 = retained earnings / total assets
iii) X_3 = earnings before interest and taxes / total assets
iv) X_4 = market value of equity / book value of total debt
v) X_5 = sales / total assets

The detailed measurements of each key financial ratios are outlined in Appendix 1. Based on Altman's model, the discriminant function of Z-Score is known as:

$$Z = 1.2 X_1 + 1.4 X_2 + 3.3 X_3 + 0.6 X_4 + 0.999 X_5$$

Using the common set of samples, the stock price of the samples is collected and stock return is calculated. The stock return is then adjusted against the market return to determine the similarities and differences between the distressed companies and viable companies.

Statistical tests will then be undertaken to test the hypotheses formulated. In short, for each of the model, the samples are tested to determine whether:
i) the means of the sample represents the means of population;
ii) the means of one group is the same with another group.

The Data Collection procedures and data analysis techniques are explained in details in the following section.

3.2 Data Collection Procedures

Data on public listed companies were extracted from the KLSE Website. Samples selected are well representative of various sectors except for finance and technology sectors. These two sectors were left out due largely to possible interference on the overall findings.

Reflective of their business nature, the ratios of companies listed under the finance sectors are different from companies from other sectors. As for the technology sector, there are insufficient samples to represent this sector as this sector was only introduced in the late 1990s. By excluding the two sectors, it is unlikely to adversely affect the overall findings.

Samples were selected using the following procedure:

a) Population was stratified by company size and economic sector. The PN4 samples were then selected using random sampling.

b) The selected samples must be listed on the KLSE for a period of at least three years prior to the date of classification. This was to ensure that information on financial performance and stock price data were available for analysis.

c) For the control group ie. viable samples were matched with PN4 samples on the following basis:

   i) the control group must be from the same sector as its paired PN4 samples;

   ii) the selected sample was as close as possible in size to its paired PN4 sample;

   iii) the financial data and monthly stock price of the selected sample, for a calendar period identical to that of its paired PN4 samples, were available.

Based on the above procedures, 20 samples each from PN4 and viable companies representing main board and Second Board groups were selected, as referred to in Appendix 2.

3.1.1 Ratio Model

Data on financial performance of the selected samples were obtained from published annual accounts and/or downloaded from the KLSE Website. The period of analysis covers the 3 years preceding to the month of classification, identified as Y-1, Y-2 and Y-3 respectively. Y-1 refers to the one year before the sample was classified as PN4 or distressed company. The classification date for the selected PN4 samples range from February 2001 to July 2002.

For example, if a company was classified as a PN4 company in February 2001, the Y-1 refers to the financial ratios sourced from the audited accounts for the period ended on or before January 2001. Y-2 and Y-3 refers to 2 years and 3 years prior to the distress period respectively.

For each period of review:

a) information on the samples' consolidated total assets, working capital, retained earnings, earnings before interest and tax (EBIT), market value of equity as of each financial year-end, book value of debt and sales were extracted;
b) thereafter, the financial ratios from X_1 to X_5 were computed using the identified formula.
c) Z-Score for each sample was calculated over the three period by applying the Altman's formula.

3.1.2 Market Return Model

Data were extracted from Bloomberg Financial Services and Hydra. The period of analysis covers 36 months preceding the distress event.

Data from each sample were extracted in the following manner:

a) month-end closing price was first obtained from the identified sources;
b) calculate the rate of stock return for the month t using the formula:

$R_{it} = (P_{it} - P_{it-1}) / P_{it-1}$, whereby

R_{it} = month-end return for security i on trading month t;

P_{it} = closing price of security i on trading month t;

P_{it-1} = closing price of share i on trading month t – 1;

t = -1 to –36 months preceding the month of classification

i = samples selected for PN4 and viable companies

c) for the market rate of return, the closing values of the KLSE Composite Index and Second Board Index were applied:

$R_{mt} = (I_{mt} - I_{mt-1}) / I_{mt-1}$, whereby

R_{mt} = month-end return for market m on trading month t;

I_{mt} = closing price of market m on trading month t;

I_{mt-1} = closing price of share m on trading month t – 1;

t = -1 to –36 months preceding the month of classification

m = KLSE Composite Index (for Main Board) / Second Board index (Second Board)

d) The market-adjusted excess return for securities i on month t was formulated by deducting the monthly market portfolio on month t from the monthly rate of return for security i on month t as represented by:

$AR_{it} = R_{it} - R_{mt}$, whereby AR_{it} was the rate of return for security i in the period t in excess of the market return.

e) The average market-adjusted excess return of n observations for the given period t may be obtained by the weighted average market-adjusted return of each securities represented by:

$AAR_t = 1/n \sum AR_{it}$, whereby n = the number of observations in the period t.

f) To compute the cumulative average market-adjusted return for the period from the first month preceding the first announcement to 36 months prior to the first announcement:

$CAR = \sum AAR_t$, whereby AAR_t = average market-adjusted excess return for the period t.

3.2 Data Analysis Techniques

Statistical tests were conducted to determine the significance of the data samples. Among the tests were:

3.2.1 Test of Significance of Means

The hypothesis formulated is as follows:

H_o: $\mu = 0$;

H_1: $\mu \neq 0$, whereby μ = mean of population

It is assumed that the sample is normally distributed. Since $n < 30$, student-t distribution is applied. At a significant level of 10 percent (α = 10%), the observed t-value is computed at follows:

$$\text{t-obs} = \frac{X}{S_X}$$

whereby, X = mean of sample and S_X =standard error of the mean. The t-obs will then be compared with the critical value of t at a degree of freedom of n-1.

If the observed t-statistic is greater than the critical value, the H_0 is rejected, confirming that the sample mean is statistically significant at 0.10 percent level.

3.2.2 Test of Difference of Means

The t-test may be used to test the hypothesis of differences in mean between two independent sample groups ie. the viable group and the financially distressed group. Samples are assumed to be drawn from normal distribution with homoscedasticity in the variances of the two groups.

The hypothesis may be stated as follows:

H_o: $\mu_1 = \mu_2$;

H_1: $\mu_1 \neq \mu_2$,

whereby $\mu_{1,2}$ = means of population for viable and financially distressed groups respectively.

The observed t-value is calculated based on the following formula:

$$t = \frac{\text{mean 1} - \text{mean 2}}{\text{Variability of random means}}$$

The t-value at the degree of freedom of n - k (where $n = n_1 + n_2$ and k = number of groups) is then compared to the critical t-value at the 0.10 percent significance level to determine the result of the test.

3.2.3 Interpretation of Z-Score

From the Z-Score calculated, Altman (1968) divided them into three categories, namely:

Z-Score (Z)	Interpretation
$Z > 2.99$	Non-distress
$1.81 \leq Z \leq 2.99$	Zone of ignorance
$Z < 1.81$	Distress

Any score which is greater than 2.99 represents the non-distress zone while a score less than 1.81 refers to distress position. For the cut-off range (ie. z-core between 1.81 and 2.99), this zone contained both distress and non-distress companies. It is known as the zone of ignorance.

In each case, if $Z < 2.99$, the company reflects the financial distress profile and itself is "at risk". If $Z > 2.99$, the company is classified as "solvent". The lower the Z-Score (which could dipped into the negative zone), the higher the financial distress level suffered by the company. On the other hand, the higher the value of Z-Score, the stronger is its financial position.